

CLAIMS

What is claimed is:

- 1 1. A method comprising:
2 integrating an inductor on a spacer between upper and lower dies in stacked
3 dies; and
4 attaching conductors to electrically connect the inductor to one of the upper and
5 lower dies.

- 1 2. The method of claim 1 further comprising:
2 filling adhesive between the spacer and the upper die and between the spacer
3 and the lower die.

- 1 3. The method of claim 1 wherein integrating comprises:
2 integrating the inductor being a thin-film inductor.

- 1 4. The method of claim 1 wherein integrating comprises:
2 integrating the inductor having a thickness substantially less than thickness of
3 the spacer.

- 1 5. The method of claim 4 wherein integrating comprises:
2 integrating the inductor having a multi-turn geometry.

- 1 6. The method of claim 1 wherein integrating comprises:
2 integrating the inductor having an inductance of approximately between 1 nH to
3 10 nH.

- 1 7. The method of claim 1 wherein attaching the conductors comprises:
2 attaching bumps to electrically connect the inductor to at least one of the upper
3 and lower dies.

- 1 8. The method of claim 1 further comprising:
2 filling adhesive between the lower die to a package substrate.

- 1 9. A spacer assembly comprising:

2 a inductor integrated on a spacer between upper and lower dies in stacked dies;
3 and
4 conductors attached to the inductor to connect the inductor to at least one of the
5 upper and lower dies.

1 10. The spacer assembly of claim 9 further comprising:
2 adhesive layers filled between the spacer and the upper die and between the
3 spacer and the lower die.

1 11. The spacer assembly of claim 9 wherein the inductor is a thin-film
2 inductor.

1 12. The spacer assembly of claim 9 wherein the inductor has a thickness
2 substantially less than thickness of the spacer.

1 13. The spacer assembly of claim 12 wherein the inductor has a multi-turn
2 geometry.

1 14. The spacer assembly of claim 9 wherein the inductor has an inductance
2 of approximately between 1 nH to 10 nH.

1 15. The spacer assembly of claim 9 wherein the conductors comprises:
2 bumps attached to the inductor to electrically connect the inductor to at least
3 one of the upper and lower dies.

1 16. The spacer assembly of claim 9 wherein the lower die is attached to a
2 package substrate by an adhesive between the lower die and the package substrate.

1 17. A die assembly comprising:
2 a package substrate;
3 a plurality of stacked dies on the package substrate and having at least an upper
4 die and a lower die; and
5 at least a spacer assembly between the upper and lower dies, the spacer
6 assembly comprising:
7 a inductor integrated on a spacer between the upper and lower dies, and

8 conductors attached to the inductor to electrically connect the inductor
9 to at least one of the upper and lower dies.

1 18. The die assembly of claim 17 wherein the spacer assembly further
2 comprises:

3 adhesive layers filled between the spacer and the upper die and between the
4 spacer and the lower die.

1 19. The die assembly of claim 17 wherein the inductor is a thin-film
2 inductor.

1 20. The die assembly of claim 17 wherein the inductor has a thickness
2 substantially less than thickness of the spacer.

1 21. The die assembly of claim 20 wherein the inductor has a multi-turn
2 geometry.

1 22. The die assembly of claim 17 wherein the inductor has an inductance of
2 approximately between 1 nH to 10 nH.

1 23. The die assembly of claim 17 wherein the conductors comprises:
2 bumps attached to the inductor to electrically connect the inductor to at least
3 one of the upper and lower dies.

1 24. The die assembly of claim 17 wherein the lower die is attached to the
2 package substrate by an adhesive between the lower die and the package substrate.

3 25. A method comprising:
4 integrating a resistor on a spacer between upper and lower dies in stacked dies;
5 and
6 attaching conductors to electrically connect the resistor to one of the upper and
7 lower dies.

1 26. The method of claim 25 further comprising:
2 filling adhesive between the spacer and the upper die and between the spacer
3 and the lower die.

1 27. The method of claim 25 wherein integrating comprises:
2 integrating the resistor being a thin-film resistor.

1 28. The method of claim 25 wherein integrating comprises:
2 integrating the resistor having a thickness substantially less than thickness of the
3 spacer.

1 29. The method of claim 28 wherein integrating comprises:
2 integrating the resistor having a multi-turn geometry.

1 30. The method of claim 25 wherein integrating comprises:
2 integrating the resistor having a resistance of approximately between 0.2 ohm to
3 2 ohms.

1 31. The method of claim 25 wherein attaching the conductors comprises:
2 attaching bumps to electrically connect the resistor to at least one of the upper
3 and lower dies.

1 32. The method of claim 25 further comprising:
2 filling adhesive between the lower die to a package substrate.

1 33. A spacer assembly comprising:
2 a resistor integrated on a spacer between upper and lower dies in stacked dies;
3 and
4 conductors attached to the resistor to connect the resistor to at least one of the
5 upper and lower dies.

1 34. The spacer assembly of claim 33 further comprising:
2 adhesive layers filled between the spacer and the upper die and between the
3 spacer and the lower die.

1 35. The spacer assembly of claim 33 wherein the resistor is a thin-film
2 resistor.

1 36. The spacer assembly of claim 33 wherein the resistor has a thickness
2 substantially less than thickness of the spacer.

1 37. The spacer assembly of claim 36 wherein the resistor has a multi-turn
2 geometry.

1 38. The spacer assembly of claim 33 wherein the resistor has a resistance of
2 approximately between 0.2 ohm to 2 ohms.

1 39. The spacer assembly of claim 33 wherein the conductors comprises:
2 bumps attached to the resistor to electrically connect the resistor to at least one
3 of the upper and lower dies.

1 40. The spacer assembly of claim 33 wherein the lower die is attached to a
2 package substrate by an adhesive between the lower die and the package substrate.

1 41. A die assembly comprising:
2 a package substrate;
3 a plurality of stacked dies on the package substrate and having at least an upper
4 die and a lower die; and
5 at least a spacer assembly between the upper and lower dies, the spacer
6 assembly comprising:
7 a resistor integrated on a spacer between the upper and lower dies, and
8 conductors attached to the resistor to electrically connect the resistor to
9 at least one of the upper and lower dies.

1 42. The die assembly of claim 41 wherein the spacer assembly further
2 comprises:
3 adhesive layers filled between the spacer and the upper die and between the
4 spacer and the lower die.

1 43. The die assembly of claim 41 wherein the resistor is a thin-film resistor.

1 44. The die assembly of claim 41 wherein the resistor has a thickness
2 substantially less than thickness of the spacer.

1 45. The die assembly of claim 44 wherein the resistor has a multi-turn
2 geometry.

1 46. The die assembly of claim 41 wherein the resistor has a resistance of
2 approximately between 0.2 ohm to 2 ohms.

1 47. The die assembly of claim 41 wherein the conductors comprises:
2 bumps attached to the resistor to electrically connect the resistor to at least one
3 of the upper and lower dies.

1 48. The die assembly of claim 41 wherein the lower die is attached to the
2 package substrate by an adhesive between the lower die and the package substrate.